CLAIMS

Sub B1

1. A crystal growth method for the group-III nitride and related compound semiconductors, comprising:

forming a MOCVD-grown periodic or nonperiodic multi-layered buffer on a substrate at a first temperature in which the layers alternate between at least two types of compound semiconductors A and B different from each other in lattice constant, energy band gap, layer thickness, and composition; and

forming a MOCVD-grown layer at a second temperature which is higher than the first of a group-III nitride or related compound semiconductor on the formed multi-layered buffer.

2. A crystal growth method according to claim 1, further comprising doping a n- or p-type in said group-III nitride or related compound semiconductor.

3. A crystal growth method according to claim 1, wherein the compound semiconductors A and B are alternately and periodically grown by MOCVD on said substrate in the sequence of AB.....AB to form said multi-layered buffer.

4. A crystal growth method according to claim 1, wherein the compound semiconductors A and B are alternately grown by MOCVD on a substrate in the sequence of AB.....AB varying in thickness of each layer to form a multi-layered buffer.

5. A crystal growth method according to claim 1, wherein a number of compound semiconductors A, B, C ..... form a sequence of ABC..... wherein said sequence is alternately grown on said substrate at said first temperature to form said multi-layered buffer, and wherein said compound semiconductors are different from each other in lattice constant, energy band gap, layer thickness, and composition.

6. A crystal growth method according to claim 1, wherein said substrate is made of sapphire wafer with any possible orientation.

7. A crystal growth method according to claim 1, wherein said first temperature is around 525 °C and said second temperature is around 1,050 °C.

8. A crystal growth method according to claim 3, wherein said

multi-layered buffer consists of three periods of repeated AB units and the total layer thickness of said multi-layered buffer is approximately 24 nm.

9. A crystal growth method according to claim 3, wherein said compound semiconductors A and B are made of GaN and $Ga_xAl_{1-x}N$ ($0 \leq x \leq 1$), respectively.

10. A crystal growth method according to claim 3, wherein said compound semiconductors A and B are made of GaN and $Ga_yIn_{1-y}N$ ($0 \leq y \leq 1$), respectively.

11. A crystal growth method according to claim 5, wherein said compound semiconductors A, B, C, ... are made of GaN, $Ga_xAl_{1-x}N$ ($0 \leq x \leq 1$), $Ga_yIn_{1-y}N$ ($0 \leq y \leq 1$)....., respectively.

12. A group-III nitride or related compound semiconductor, comprising:

a MOCVD-grown periodic or nonperiodic multi-layered buffer on a substrate at a first temperature in which the layers alternate between at least two types of compound semiconductors A and B different from each other in lattice constant, energy band gap, layer thickness, and composition; and

a MOCVD-grown layer at a second temperature which is higher than the first of a group-III nitride or related compound semiconductor on the formed multi-layered buffer.